

CLAIMS:

1. An image processing method comprising the steps of:
defining a local region containing a pixel of interest in an original
5 image;
defining in a plurality of modes a pixel group consisting of a
plurality of pixels containing said pixel of interest and a pixel group(s) consisting
of a plurality of pixels not overlapping those in the former pixel group, in said
region;
10 selecting a pixel group mode from said defined plurality of pixel
group modes which best fits a structure of said original image in said region; and
producing an image using an average pixel value of said pixel
group containing the pixel of interest in said selected pixel group mode, as a new
pixel value for said pixel of interest.
15
2. An image processing method comprising the steps of:
defining a local region containing a pixel of interest in an original
image;
defining in a plurality of modes a pixel group consisting of a
20 plurality of pixels containing said pixel of interest and a pixel group(s) consisting
of a plurality of pixels not overlapping those in the former pixel group, in said
region;
selecting a pixel group mode from said defined plurality of pixel
group modes which best fits a structure of said original image in said region;
25 calculating an average pixel value of said pixel group containing
the pixel of interest in said selected pixel group mode;
calculating an average pixel value of said region; and
producing an image using a pixel value obtained from a weighted
addition of said average pixel value of the pixel group and said average pixel
30 value of the region, as a new pixel value for said pixel of interest.
3. An image processing method comprising the steps of:
defining a local region containing a pixel of interest in an original
image;

00053598-052304
T05290 885988

defining in a plurality of modes a pixel group consisting of a plurality of pixels containing said pixel of interest and a pixel group(s) consisting of a plurality of pixels not overlapping those in the former pixel group, in said region;

5 selecting a pixel group mode from said defined plurality of pixel
group modes which best fits a structure of said original image in said region;

calculating an average pixel value of said pixel group containing the pixel of interest in said selected pixel group mode;

calculating an average pixel value of said region;

10 performing a weighted addition on said average pixel value of the pixel group and said average pixel value of the region; and

producing an image using a pixel value obtained from a weighted addition of the pixel value obtained from said former weighted addition and a pixel value of said pixel of interest, as a new pixel value for said pixel of interest.

15

4. An image processing method comprising the steps of:

defining a local region containing a pixel of interest in an original image;

defining in a plurality of modes a pixel group consisting of a

20 plurality of pixels containing said pixel of interest and a pixel group(s) consisting
of a plurality of pixels not overlapping those in the former pixel group, in said
region;

selecting a pixel group mode from said defined plurality of pixel group modes which best fits a structure of said original image in said region;

25 calculating an average pixel value of said pixel group containing
the pixel of interest in said selected pixel group mode;

calculating an average pixel value of said region;

performing a weighted addition on said average pixel value of the pixel group and said average pixel value of the region;

30 producing an image using a pixel value obtained from a weighted
addition of the pixel value obtained from said former weighted addition and a
pixel value of said pixel of interest, as a new pixel value for said pixel of interest;
and

performing a weighted addition on said produced image and said

original image.

5 5. The image processing method of claim 4, wherein a weighting factor for said weighted addition of said produced image and said original image is adjustable.

10 6. The image processing method of any one of claims 2 — 4, wherein a weighting factor for said weighted addition of said average pixel value of the pixel group and said average pixel value of the region is a function of a minimum value and a maximum value of a total sum of respective residual sums of squares of pixel values of said pixel groups, said total sum being calculated for each of said pixel group modes.

15 7. The image processing method of claim 6, wherein said function is a function which makes a weight for said average pixel value of the region maximum when the minimum value and the maximum value of said total sum of residual sums of squares are equal, and reduces the weight for said average pixel value of the region as the minimum value of said total sum of residual sums of squares becomes smaller with respect to the maximum value.

20 8. The image processing method of claim 3 or 4, wherein a weighting factor for said weighted addition of the pixel value obtained from said former weighted addition and a pixel value of said pixel of interest is a function of the minimum value of said total sum of residual sums of squares of pixel values of the pixel groups, said total sum being calculated for each of said pixel group modes, and the variance of noise of said original image.

30 9. The image processing method of claim 8, wherein said function is a function which makes a weight for the pixel value obtained from said former weighted addition maximum when the minimum value of said total sum of residual sums of squares divided by the number of pixels in said pixel group mode is equal to said variance of noise, and reduces the weight for the pixel value obtained from said former weighted addition as the difference between the minimum value of said total sum of residual sums of squares divided by the

number of pixels in said pixel group mode and said variance of noise becomes larger.

10. The image processing method of any one of claims 1 — 4,
5 wherein said step of selecting a pixel group mode is performed by selecting a pixel group mode in which said total sum of residual sums of squares of pixel values of the pixel groups is minimum.

11. The image processing method of any one of claims 1 — 4,
10 wherein said step of selecting a pixel group mode is performed by selecting a pixel group mode in which said total sum of residual sums of squares of pixel values of the pixel groups is closest to the variance of noise of said original image multiplied by the number of pixels in the pixel group mode.

12. An image processing method comprising the steps of:
defining in a plurality of modes a local region containing a pixel
of interest in an original image;
defining in a plurality of modes a pixel group consisting of a
plurality of pixels containing said pixel of interest and a pixel group(s) consisting
20 of a plurality of pixels not overlapping those in the former pixel group, in each of
said defined plurality of modes of region;
selecting a pixel group mode from said defined plurality of pixel
group modes which best fits a structure of said original image in said region
throughout said defined plurality of modes of region; and
25 producing an image using an average pixel value of said pixel
group containing the pixel of interest in said selected pixel group mode, as a new
pixel value for said pixel of interest.

13. An image processing method comprising the steps of:
30 defining in a plurality of modes a local region containing a pixel
of interest in an original image;
defining in a plurality of modes a pixel group consisting of a
plurality of pixels containing said pixel of interest and a pixel group(s) consisting
of a plurality of pixels not overlapping those in the former pixel group, in each of

00553998 "052304
100229 99312

said defined plurality of modes of region;

selecting a pixel group mode from said defined plurality of pixel group modes which best fits a structure of said original image in said region throughout said defined plurality of modes of region;

5 calculating an average pixel value of said pixel group containing the pixel of interest in said selected pixel group mode;

calculating an average pixel value of said region in one of said plurality of modes of region in which said selected pixel group mode is defined; and

10 producing an image using a pixel value obtained from a weighted addition of said average pixel value of the pixel group and said average pixel value of the region, as a new pixel value for said pixel of interest.

14. An image processing method comprising the steps of:

15 defining in a plurality of modes a local region containing a pixel of interest in an original image;

defining in a plurality of modes a pixel group consisting of a plurality of pixels containing said pixel of interest and a pixel group(s) consisting of a plurality of pixels not overlapping those in the former pixel group, in each of
20 said defined plurality of modes of region;

selecting a pixel group mode from said defined plurality of pixel group modes which best fits a structure of said original image in said region throughout said defined plurality of modes of region;

25 calculating an average pixel value of said pixel group containing the pixel of interest in said selected pixel group mode;

calculating an average pixel value of said region in one of said plurality of modes of region in which said selected pixel group mode is defined;

performing a weighted addition on said average pixel value of the pixel group and said average pixel value of the region; and

30 producing an image using a pixel value obtained from a weighted addition of the pixel value obtained from said former weighted addition and a pixel value of said pixel of interest, as a new pixel value for said pixel of interest.

15. An image processing method comprising the steps of:

defining in a plurality of modes a local region containing a pixel of interest in an original image;

5 defining in a plurality of modes a pixel group consisting of a plurality of pixels containing said pixel of interest and a pixel group(s) consisting of a plurality of pixels not overlapping those in the former pixel group, in each of said defined plurality of modes of region;

selecting a pixel group mode from said defined plurality of pixel group modes which best fits a structure of said original image in said region throughout said defined plurality of modes of region;

10 calculating an average pixel value of said pixel group containing the pixel of interest in said selected pixel group mode;

calculating an average pixel value of said region in one of said plurality of modes of region in which said selected pixel group mode is defined;

15 performing a weighted addition on said average pixel value of the pixel group and said average pixel value of the region;

producing an image using a pixel value obtained from a weighted addition of the pixel value obtained from said former weighted addition and a pixel value of said pixel of interest, as a new pixel value for said pixel of interest; and

20 performing a weighted addition on said produced image and said original image.

16. The image processing method of claim 15, wherein a weighting factor for said weighted addition of said produced image and said original image is adjustable.

17. The image processing method of any one of claims 13 — 15, wherein a weighting factor for said weighted addition of said average pixel value of the pixel group and said average pixel value of the region is a function of a minimum value and a maximum value of a total sum of respective residual sums of squares of pixel values of said pixel groups, said total sum being calculated for each of said pixel group modes throughout said defined plurality of modes of region.

18. The image processing method of claim 17, wherein said function is a function which makes a weight for said average pixel value of the region maximum when the minimum value and the maximum value of said total sum of residual sums of squares are equal, and reduces the weight for said average pixel value of the region as the minimum value of said total sum of residual sums of squares becomes smaller with respect to the maximum value.

19. The image processing method of claim 14 or 15, wherein a weighting factor for said weighted addition of the pixel value obtained from said former weighted addition and a pixel value of said pixel of interest is a function of the minimum value of said total sum of residual sums of squares of pixel values of the pixel groups, said total sum being calculated for each of said pixel group modes throughout said defined plurality of modes of region, and the variance of noise of said original image.

20. The image processing method of claim 19, wherein said function is a function which makes a weight for the pixel value obtained from said former weighted addition maximum when the minimum value of said total sum of residual sums of squares divided by the number of pixels in said pixel group mode is equal to said variance of noise, and reduces the weight for the pixel value obtained from said former weighted addition as the difference between the minimum value of said total sum of residual sums of squares divided by the number of pixels in said pixel group mode and said variance of noise becomes larger.

21. The image processing method of any one of claims 12 — 15, wherein said step of selecting a pixel group mode is performed by selecting an image group mode in which said total sum of residual sums of squares of pixel values of the pixel groups is minimum throughout said defined plurality of modes of region.

22. The image processing method of any one of claims 12 — 15, wherein said step of selecting a pixel group mode is performed by selecting a pixel group mode in which said total sum of residual sums of squares of pixel

values of the pixel groups is closest to the variance of noise of said original image multiplied by the number of pixels in the pixel group mode.

23. An image processing apparatus comprising:
- 5 a region defining device for defining a local region containing a pixel of interest in an original image;
- a pixel group defining device for defining in a plurality of modes a pixel group consisting of a plurality of pixels containing said pixel of interest and a pixel group(s) consisting of a plurality of pixels not overlapping those in the
- 10 former pixel group, in said region;
- a selecting device for selecting a pixel group mode from said defined plurality of pixel group modes which best fits a structure of said original image in said region; and
- an image producing device for producing an image using an
- 15 average pixel value of said pixel group containing the pixel of interest in said selected pixel group mode, as a new pixel value for said pixel of interest.

24. An image processing apparatus comprising:
- 20 a region defining device for defining a local region containing a pixel of interest in an original image;
- a pixel group defining device for defining in a plurality of modes a pixel group consisting of a plurality of pixels containing said pixel of interest and a pixel group(s) consisting of a plurality of pixels not overlapping those in the former pixel group, in said region;
- 25 a selecting device for selecting a pixel group mode from said defined plurality of pixel group modes which best fits a structure of said original image in said region;
- a first pixel value calculating device for calculating an average pixel value of said pixel group containing the pixel of interest in said selected
- 30 pixel group mode;
- a second pixel value calculating device for calculating an average pixel value of said region; and
- an image producing device for producing an image using a pixel value obtained from a weighted addition of said average pixel value of the pixel

group and said average pixel value of the region, as a new pixel value for said pixel of interest.

25. An image processing apparatus comprising:

5 a region defining device for defining a local region containing a
pixel of interest in an original image;

a pixel group defining device for defining in a plurality of modes
a pixel group consisting of a plurality of pixels containing said pixel of interest
and a pixel group(s) consisting of a plurality of pixels not overlapping those in the
former pixel group, in said region;

a selecting device for selecting a pixel group mode from said defined plurality of pixel group modes which best fits a structure of said original image in said region;

15 a first pixel value calculating device for calculating an average pixel value of said pixel group containing the pixel of interest in said selected pixel group mode;

a second pixel value calculating device for calculating an average pixel value of said region;

an addition device for performing a weighted addition on said
20 average pixel value of the pixel group and said average pixel value of the region;
and

an image producing device for producing an image using a pixel value obtained from a weighted addition of the pixel value obtained from said former weighted addition and a pixel value of said pixel of interest, as a new pixel value for said pixel of interest.

26. An image processing apparatus comprising:

a region defining device for defining a local region containing a pixel of interest in an original image;

30 a pixel group defining device for defining in a plurality of modes
a pixel group consisting of a plurality of pixels containing said pixel of interest
and a pixel group(s) consisting of a plurality of pixels not overlapping those in the
former pixel group, in said region;

a selecting device for selecting a pixel group mode from said

defined plurality of pixel group modes which best fits a structure of said original image in said region;

5 a first pixel value calculating device for calculating an average pixel value of said pixel group containing the pixel of interest in said selected pixel group mode;

a second pixel value calculating device for calculating an average pixel value of said region;

10 a first addition device for performing a weighted addition on said average pixel value of the pixel group and said average pixel value of the region;

an image producing device for producing an image using a pixel value obtained from a weighted addition of the pixel value obtained from said former weighted addition and a pixel value of said pixel of interest, as a new pixel value for said pixel of interest; and

15 a second addition device for performing a weighted addition on said produced image and said original image.

20 27. The image processing apparatus of claim 26, wherein a weighting factor for said weighted addition of said produced image and said original image is adjustable.

28. The image processing apparatus of any one of claims 24 — 26, wherein that a weighting factor for said weighted addition of said average pixel value of the pixel group and said average pixel value of the region is a function of a minimum value and a maximum value of a total sum of respective residual sums of squares of pixel values of said pixel groups, said total sum being calculated for
25 each of said pixel group modes.

29. The image processing apparatus of claim 28, wherein said function is a function which makes a weight for said average pixel value of the region maximum when the minimum value and the maximum value of said total sum of residual sums of squares are equal, and reduces the weight for said average pixel value of the region as the minimum value of said total sum of residual sums of squares becomes smaller with respect to the maximum value.
30

30. The image processing apparatus of claim 25 or 26, wherein a weighting factor for said weighted addition of the pixel value obtained from said former weighted addition and a pixel value of said pixel of interest is a function of the minimum value of said total sum of residual sums of squares of pixel values of the pixel groups, said total sum being calculated for each of said pixel group modes, and the variance of noise of said original image.

31. The image processing apparatus of claim 30, wherein said function is a function which makes a weight for the pixel value obtained from said former weighted addition maximum when the minimum value of said total sum of residual sums of squares divided by the number of pixels in said pixel group mode is equal to said variance of noise, and reduces the weight for the pixel value obtained from said former weighted addition as the difference between the minimum value of said total sum of residual sums of squares divided by the number of pixels in said pixel group mode and said variance of noise becomes larger.

32. The image processing apparatus of any one of claims 23 — 26, wherein said selecting of a pixel group mode is performed by selecting a pixel group mode in which said total sum of residual sums of squares of pixel values of the pixel groups is minimum.

33. The image processing apparatus of any one of claim 23 — 26, wherein said selecting of a pixel group mode is performed by selecting a pixel group mode in which said total sum of residual sums of squares of pixel values of the pixel groups is closest to the variance of noise of said original image multiplied by the number of pixels in the pixel group mode.

34. An image processing apparatus comprising:
a region defining device for defining in a plurality of modes a local region containing a pixel of interest in an original image;
a pixel group defining device for defining in a plurality of modes a pixel group consisting of a plurality of pixels containing said pixel of interest and a pixel group(s) consisting of a plurality of pixels not overlapping those in the

former pixel group, in each of said defined plurality of modes of region;

a selecting device for selecting a pixel group mode from said defined plurality of pixel group modes which best fits a structure of said original image in said region throughout said defined plurality of modes of region;

5 an image producing device for producing an image using an average pixel value of said pixel group containing the pixel of interest in said selected pixel group mode, as a new pixel value for said pixel of interest.

35. An image processing apparatus comprising:

10 a region defining device for defining in a plurality of modes a
local region containing a pixel of interest in an original image;

a pixel group defining device for defining in a plurality of modes
a pixel group consisting of a plurality of pixels containing said pixel of interest
and a pixel group(s) consisting of a plurality of pixels not overlapping those in the
15 former pixel group, in each of said defined plurality of modes of region;

a selecting device for selecting a pixel group mode from said defined plurality of pixel group modes which best fits a structure of said original image in said region throughout said defined plurality of modes of region;

20 a first pixel value calculating device for calculating an average pixel value of said pixel group containing the pixel of interest in said selected pixel group mode;

a second pixel value calculating device for calculating an average pixel value of said region in one of said plurality of modes of region in which said selected pixel group mode is defined; and

25 an image producing device for producing an image using a pixel value obtained from a weighted addition of said average pixel value of the pixel group and said average pixel value of the region, as a new pixel value for said pixel of interest.

30 36. An image processing apparatus characterized in that the apparatus
 comprises:

a region defining device for defining in a plurality of modes a local region containing a pixel of interest in an original image;

a pixel group defining device for defining in a plurality of modes

a pixel group consisting of a plurality of pixels containing said pixel of interest and a pixel group(s) consisting of a plurality of pixels not overlapping those in the former pixel group, in each of said defined plurality of modes of region;

5 a selecting device for selecting a pixel group mode from said defined plurality of pixel group modes which best fits a structure of said original image in said region throughout said defined plurality of modes of region;

a first pixel value calculating device for calculating an average pixel value of said pixel group containing the pixel of interest in said selected pixel group mode;

10 a second pixel value calculating device for calculating an average pixel value of said region in one of said plurality of modes of region in which said selected pixel group mode is defined;

an addition device for performing a weighted addition on said average pixel value of the pixel group and said average pixel value of the region;

15 and

an image producing device for producing an image using a pixel value obtained from a weighted addition of the pixel value obtained from said former weighted addition and a pixel value of said pixel of interest, as a new pixel value for said pixel of interest.

20

37. An image processing apparatus characterized in that the apparatus comprises:

a region defining device for defining in a plurality of modes a local region containing a pixel of interest in an original image;

25 a pixel group defining device for defining in a plurality of modes a pixel group consisting of a plurality of pixels containing said pixel of interest and a pixel group(s) consisting of a plurality of pixels not overlapping those in the former pixel group, in each of said defined plurality of modes of region;

30 a selecting device for selecting a pixel group mode from said defined plurality of pixel group modes which best fits a structure of said original image in said region throughout said defined plurality of modes of region;

a first pixel value calculating device for calculating an average pixel value of said pixel group containing the pixel of interest in said selected pixel group mode;

a second pixel value calculating device for calculating an average pixel value of said region in one of said plurality of modes of region in which said selected pixel group mode is defined;

5 a first addition device for performing a weighted addition on said average pixel value of the pixel group and said average pixel value of the region;

an image producing device for producing an image using a pixel value obtained from a weighted addition of the pixel value obtained from said former weighted addition and a pixel value of said pixel of interest, as a new pixel value for said pixel of interest; and

10 a second addition device for performing a weighted addition on said produced image and said original image.

38. The image processing apparatus of claim 37, wherein a weighting factor for said weighted addition of said produced image and said original image is adjustable.

39. The image processing apparatus of any one of claims 35 — 37, wherein a weighting factor for said weighted addition of said average pixel value of the pixel group and said average pixel value of the region is a function of a minimum value and a maximum value of a total sum of respective residual sums of squares of pixel values of said pixel groups, said total sum being calculated for each of said pixel group modes throughout said defined plurality of modes of region.

40. The image processing apparatus of claim 39, wherein said function is a function which makes a weight for said average pixel value of the region maximum when the minimum value and the maximum value of said total sum of residual sums of squares are equal, and reduces the weight for said average pixel value of the region as the minimum value of said total sum of residual sums of squares becomes smaller with respect to the maximum value.

41. The image processing apparatus of claim 36 or 37, wherein a weighting factor for said weighted addition of the pixel value obtained from said former weighted addition and a pixel value of said pixel of interest is a function of

05863550-052301

the minimum value of said total sum of residual sums of squares of pixel values of the pixel groups, said total sum being calculated for each of said pixel group modes throughout said defined plurality of modes of region, and the variance of noise of said original image.

5

42. The image processing apparatus of claim 41, wherein said function is a function which makes a weight for the pixel value obtained from said former weighted addition maximum when the minimum value of said total sum of residual sums of squares divided by the number of pixels in said pixel group mode is equal to said variance of noise, and reduces the weight for the pixel value obtained from said former weighted addition as the difference between the minimum value of said total sum of residual sums of squares divided by the number of pixels in said pixel group mode and said variance of noise becomes larger.

15

43. The image processing apparatus of any one of claims 34 — 37, wherein said selecting of a pixel group mode is performed by selecting an image group mode in which said total sum of residual sums of squares of pixel values of the pixel groups is minimum throughout said defined plurality of modes of region.

20

44. The image processing apparatus of any one of claims 34 — 37, wherein said selecting of a pixel group mode is performed by selecting a pixel group mode in which said total sum of residual sums of squares of pixel values of the pixel groups is closest to the variance of noise of said original image multiplied by the number of pixels in the pixel group mode.

25

45. A recording medium which records in a computer-readable manner a program for a computer to perform the functions of:

defining a local region containing a pixel of interest in an original image;

30

defining in a plurality of modes a pixel group consisting of a plurality of pixels containing said pixel of interest and a pixel group(s) consisting of a plurality of pixels not overlapping those in the former pixel group, in said region;

selecting a pixel group mode from said defined plurality of pixel group modes which best fits a structure of said original image in said region; and
producing an image using an average pixel value of said pixel group containing the pixel of interest in said selected pixel group mode, as a new
5 pixel value for said pixel of interest.

46. A recording medium which records in a computer-readable manner a program for a computer to perform the functions of:

10 defining in a plurality of modes a pixel group consisting of a plurality of pixels containing said pixel of interest and a pixel group(s) consisting of a plurality of pixels not overlapping those in the former pixel group, in said region;

selecting a pixel group mode from said defined plurality of pixel group modes which best fits a structure of said original image in said region;

15 calculating an average pixel value of said pixel group containing the pixel of interest in said selected pixel group mode;

calculating an average pixel value of said region; and

producing an image using a pixel value obtained from a weighted addition of said average pixel value of the pixel group and said average pixel
20 value of the region, as a new pixel value for said pixel of interest.

47. A recording medium which records in a computer-readable manner a program for a computer to perform the functions of:

25 defining a local region containing a pixel of interest in an original image;

defining in a plurality of modes a pixel group consisting of a plurality of pixels containing said pixel of interest and a pixel group(s) consisting of a plurality of pixels not overlapping those in the former pixel group, in said region;

30 selecting a pixel group mode from said defined plurality of pixel group modes which best fits a structure of said original image in said region;

calculating an average pixel value of said pixel group containing the pixel of interest in said selected pixel group mode;

calculating an average pixel value of said region;

performing a weighted addition on said average pixel value of the pixel group and said average pixel value of the region; and

producing an image using a pixel value obtained from a weighted addition of the pixel value obtained from said former weighted addition and a pixel value of said pixel of interest, as a new pixel value for said pixel of interest.

48. A recording medium which records in a computer-readable manner a program for a computer to perform the functions of:

defining a local region containing a pixel of interest in an original image;

defining in a plurality of modes a pixel group consisting of a plurality of pixels containing said pixel of interest and a pixel group(s) consisting of a plurality of pixels not overlapping those in the former pixel group, in said region;

selecting a pixel group mode from said defined plurality of pixel group modes which best fits a structure of said original image in said region;

calculating an average pixel value of said pixel group containing the pixel of interest in said selected pixel group mode;

calculating an average pixel value of said region;

performing a weighted addition on said average pixel value of the pixel group and said average pixel value of the region;

producing an image using a pixel value obtained from a weighted addition of the pixel value obtained from said former weighted addition and a pixel value of said pixel of interest, as a new pixel value for said pixel of interest;

and

performing a weighted addition on said produced image and said original image.

49. A recording medium which records in a computer-readable manner a program for a computer to perform the functions of:

defining in a plurality of modes a local region containing a pixel of interest in an original image;

defining in a plurality of modes a pixel group consisting of a plurality of pixels containing said pixel of interest and a pixel group(s) consisting

of a plurality of pixels not overlapping those in the former pixel group, in each of said defined plurality of modes of region;

5 selecting a pixel group mode from said defined plurality of pixel group modes which best fits a structure of said original image in said region throughout said defined plurality of modes of region; and

 producing an image using an average pixel value of said pixel group containing the pixel of interest in said selected pixel group mode, as a new pixel value for said pixel of interest.

10 50. A recording medium which records in a computer-readable manner a program for a computer to perform the functions of:

 defining in a plurality of modes a local region containing a pixel of interest in an original image;

15 defining in a plurality of modes a pixel group consisting of a plurality of pixels containing said pixel of interest and a pixel group(s) consisting of a plurality of pixels not overlapping those in the former pixel group, in each of said defined plurality of modes of region;

20 selecting a pixel group mode from said defined plurality of pixel group modes which best fits a structure of said original image in said region throughout said defined plurality of modes of region;

 calculating an average pixel value of said pixel group containing the pixel of interest in said selected pixel group mode;

25 calculating an average pixel value of said region in one of said plurality of modes of region in which said selected pixel group mode is defined; and

 producing an image using a pixel value obtained from a weighted addition of said average pixel value of the pixel group and said average pixel value of the region, as a new pixel value for said pixel of interest.

30 51. A recording medium which records in a computer-readable manner a program for a computer to perform the functions of:

 defining in a plurality of modes a local region containing a pixel of interest in an original image;

 defining in a plurality of modes a pixel group consisting of a

0946398-052304

plurality of pixels containing said pixel of interest and a pixel group(s) consisting of a plurality of pixels not overlapping those in the former pixel group, in each of said defined plurality of modes of region;

5 selecting a pixel group mode from said defined plurality of pixel group modes which best fits a structure of said original image in said region throughout said defined plurality of modes of region;

calculating an average pixel value of said pixel group containing the pixel of interest in said selected pixel group mode;

10 calculating an average pixel value of said region in one of said plurality of modes of region in which said selected pixel group mode is defined;

performing a weighted addition on said average pixel value of the pixel group and said average pixel value of the region; and

15 producing an image using a pixel value obtained from a weighted addition of the pixel value obtained from said former weighted addition and a pixel value of said pixel of interest, as a new pixel value for said pixel of interest.

52. A recording medium which records in a computer-readable manner a program for a computer to perform the functions of:

20 defining in a plurality of modes a local region containing a pixel of interest in an original image;

defining in a plurality of modes a pixel group consisting of a plurality of pixels containing said pixel of interest and a pixel group(s) consisting of a plurality of pixels not overlapping those in the former pixel group, in each of said defined plurality of modes of region;

25 selecting a pixel group mode from said defined plurality of pixel group modes which best fits a structure of said original image in said region throughout said defined plurality of modes of region;

calculating an average pixel value of said pixel group containing the pixel of interest in said selected pixel group mode;

30 calculating an average pixel value of said region in one of said plurality of modes of region in which said selected pixel group mode is defined;

performing a weighted addition on said average pixel value of the pixel group and said average pixel value of the region;

producing an image using a pixel value obtained from a weighted

0986399 "05294
19920" 866999

53. An imaging apparatus comprising:
a signal collecting device for collecting a signal from an object;
an original image producing device for producing an original
10 image based on said collected signal;
a region defining device for defining a local region containing a
pixel of interest in said original image;
a pixel group defining device for defining in a plurality of modes
a pixel group consisting of a plurality of pixels containing said pixel of interest
15 and a pixel group(s) consisting of a plurality of pixels not overlapping those in the
former pixel group, in said region;
a selecting device for selecting a pixel group mode from said
defined plurality of pixel group modes which best fits a structure of said original
image in said region; and
20 an image producing device for producing an image using an
average pixel value of said pixel group containing the pixel of interest in said
selected pixel group mode, as a new pixel value for said pixel of interest.

defined plurality of pixel group modes which best fits a structure of said original image in said region;

a first pixel value calculating device for calculating an average pixel value of said pixel group containing the pixel of interest in said selected pixel group mode;

a second pixel value calculating device for calculating an average pixel value of said region; and

an image producing device for producing an image using a pixel value obtained from a weighted addition of said average pixel value of the pixel group and said average pixel value of the region, as a new pixel value for said pixel of interest.

55. An imaging apparatus comprising:

15 a signal collecting device for collecting a signal from an object;
 an original image producing device for producing an original
image based on said collected signal;

a region defining device for defining a local region containing a pixel of interest in said original image;

a pixel group defining device for defining in a plurality of modes
20 a pixel group consisting of a plurality of pixels containing said pixel of interest
and a pixel group(s) consisting of a plurality of pixels not overlapping those in the
former pixel group, in said region;

25 a selecting device for selecting a pixel group mode from said
defined plurality of pixel group modes which best fits a structure of said original
image in said region;

a first pixel value calculating device for calculating an average pixel value of said pixel group containing the pixel of interest in said selected pixel group mode;

a second pixel value calculating device for calculating an average
30 pixel value of said region;

an addition device for performing a weighted addition on said average pixel value of the pixel group and said average pixel value of the region;
and

an image producing device for producing an image using a pixel

value obtained from a weighted addition of the pixel value obtained from said former weighted addition and a pixel value of said pixel of interest, as a new pixel value for said pixel of interest.

- 5 56. An imaging apparatus comprising:
 a signal collecting device for collecting a signal from an object;
 a riginal image producing device for producing an original image
 based on said collected signal;
 a region defining device for defining a local region containing a
 10 pixel of interest in said original image;
 a pixel group defining device for defining in a plurality of modes
 a pixel group consisting of a plurality of pixels containing said pixel of interest
 and a pixel group(s) consisting of a plurality of pixels not overlapping those in the
 former pixel group, in said region;
 15 a selecting device for selecting a pixel group mode from said
 defined plurality of pixel group modes which best fits a structure of said original
 image in said region;
 a first pixel value calculating device for calculating an average
 pixel value of said pixel group containing the pixel of interest in said selected
 20 pixel group mode;
 a second pixel value calculating device for calculating an average
 pixel value of said region;
 a first addition device for performing a weighted addition on said
 average pixel value of the pixel group and said average pixel value of the region;
 25 an image producing device for producing an image using a pixel
 value obtained from a weighted addition of the pixel value obtained from said
 former weighted addition and a pixel value of said pixel of interest, as a new pixel
 value for said pixel of interest; and
 a second addition device for performing a weighted addition on
 30 said produced image and said original image.

57. An imaging apparatus comprising:
 a signal collecting device for collecting a signal from an object;
 an original image producing device for producing an original

image based on said collected signal;

a region defining device for defining in a plurality of modes a local region containing a pixel of interest in an original image;

5 a pixel group defining device for defining in a plurality of modes
a pixel group consisting of a plurality of pixels containing said pixel of interest
and a pixel group(s) consisting of a plurality of pixels not overlapping those in the
former pixel group, in each of said defined plurality of modes of region;

a selecting device for selecting a pixel group mode from said defined plurality of pixel group modes which best fits a structure of said original
10 image in said region throughout said defined plurality of modes of region; and

an image producing device for producing an image using an average pixel value of said pixel group containing the pixel of interest in said selected pixel group mode, as a new pixel value for said pixel of interest.

15 58. An imaging apparatus characterized in that the apparatus
 comprises:

a signal collecting device for collecting a signal from an object;

an original image producing device for producing an original image based on said collected signal;

20 a region defining device for defining in a plurality of modes a
local region containing a pixel of interest in an original image;

a pixel group defining device for defining in a plurality of modes a pixel group consisting of a plurality of pixels containing said pixel of interest and a pixel group(s) consisting of a plurality of pixels not overlapping those in the former pixel group, in each of said defined plurality of modes of region;

a selecting device for selecting a pixel group mode from said defined plurality of pixel group modes which best fits a structure of said original image in said region throughout said defined plurality of modes of region;

30 a first pixel value calculating device for calculating an average pixel value of said pixel group containing the pixel of interest in said selected pixel group mode;

a second pixel value calculating device for calculating an average pixel value of said region in one of said plurality of modes of region in which said selected pixel group mode is defined; and

an image producing device for producing an image using a pixel value obtained from a weighted addition of said average pixel value of the pixel group and said average pixel value of the region, as a new pixel value for said pixel of interest.

5

59. An imaging apparatus comprising:

a signal collecting device for collecting a signal from an object;

an original image producing device for producing an original image based on said collected signal;

10 a region defining device for defining in a plurality of modes a local region containing a pixel of interest in said original image;

a pixel group defining device for defining in a plurality of modes a pixel group consisting of a plurality of pixels containing said pixel of interest and a pixel group(s) consisting of a plurality of pixels not overlapping those in the former pixel group, in each of said defined plurality of modes of region;

15 a selecting device for selecting a pixel group mode from said defined plurality of pixel group modes which best fits a structure of said original image in said region throughout said defined plurality of modes of region;

20 a first pixel value calculating device for calculating an average pixel value of said pixel group containing the pixel of interest in said selected pixel group mode;

a second pixel value calculating device for calculating an average pixel value of said region in one of said plurality of modes of region in which said selected pixel group mode is defined;

25 an addition device for performing a weighted addition on said average pixel value of the pixel group and said average pixel value of the region; and

30 an image producing device for producing an image using a pixel value obtained from a weighted addition of the pixel value obtained from said former weighted addition and a pixel value of said pixel of interest, as a new pixel value for said pixel of interest.

60. An imaging apparatus characterized in that the apparatus comprises:

- a signal collecting device for collecting a signal from an object;
an original image producing device for producing an original
image based on said collected signal;
- 5 a region defining device for defining in a plurality of modes a
local region containing a pixel of interest in said original image;
- a pixel group defining device for defining in a plurality of modes
a pixel group consisting of a plurality of pixels containing said pixel of interest
and a pixel group(s) consisting of a plurality of pixels not overlapping those in the
former pixel group, in each of said defined plurality of modes of region;
- 10 a selecting device for selecting a pixel group mode from said
defined plurality of pixel group modes which best fits a structure of said original
image in said region throughout said defined plurality of modes of region;
- a first pixel value calculating device for calculating an average
pixel value of said pixel group containing the pixel of interest in said selected
15 pixel group mode;
- a second pixel value calculating device for calculating an average
pixel value of said region in one of said plurality of modes of region in which said
selected pixel group mode is defined;
- 20 a first addition device for performing a weighted addition on said
average pixel value of the pixel group and said average pixel value of the region;
- an image producing device for producing an image using a pixel
value obtained from a weighted addition of the pixel value obtained from said
former weighted addition and a pixel value of said pixel of interest, as a new pixel
value for said pixel of interest; and
- 25 a second addition device for performing a weighted addition on
said produced image and said original image.

F0329 00000000